REMARKS

I. Introduction

In response to the Office Action dated April 19, 2005, claims 1, 2, 4, 5, 8, 11, 12, 13, 19-23, 26, and 29-30 have been amended. Claims 3, 6, 7, 9, 10, 24, 25, 27 and 28 have been canceled, and new claims 31-39 have been added. Claims 1, 2, 4, 5, 8, 11-23, 26, and 29-39 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Claim Amendments

Applicants' attorney has made amendments to the claims as indicated above. These amendments were made solely for the purpose of clarifying the language of the claims, and were not required for purposes of patentability.

III. Office Action Objections

The Office Action objects to the drawings on the basis that FIGs. 1 and 2 should be labeled as prior art. The Applicants have amended FIGs. 1A-1C and 2A-2C. Included herewith are Proposed Drawing Changes.

The Office Action objects to the disclosure because of informality in paragraphs [0033] and [0034]; applicants confirm that there is an error in the specification. The Applicants thank the Examiner for noting these errors and have amended the application accordingly.

IV. The Cited References and the Subject Invention

A. The Ishio Reference

U.S. Patent No. 4,039,961, issued August 2, 1977 to Ishio et al. discloses a demodulator for combined digital amplitude and phase keyed modulation signals. A digital carrier signal demodulation circuit is used in the carrier digital transmission system utilizing a 16-ary APK (Amplitude and Phase Keying) signal produced by the vector superposition of a second path signal consisting of a four-phase shift keying signal upon each phase of a first path signal consisting of a four-phase shift keying signal, the level of the second path signal being lower than that of the first path signal. The received 16-ary APK signal is detected with the reference carrier extracted from the

received signal, regenerated to reproduce the base band pulses of the first path signal. The recovered base band pulses remodulate the reference carrier to produce the first path signal. The phases of the recovered first path signal and received signal are compared to phase lock a voltage controlled oscillator thereby producing the reference character.

B. The Arslan Reference

U.S. Patent No. 6,574,235, issued June 3, 2003 to Arslan et al. discloses methods of receiving co-channel signals by channel separation and successive cancellation and related receivers. The method receives a plurality of communications from a respective plurality of transmitters using a common carrier frequency including receiving a plurality of information signals on a common carrier frequency corresponding to the plurality of communications from the plurality of transmitters, and generates first and second separated signals corresponding to respective first and second ones of the information signals so that the first separated signal includes a primary component corresponding to the first information signal and so that the second separated signal includes a primary component corresponding to the second information signal. The first separated signal is demodulated to provide an estimate of a first information sequence corresponding to the first information signal, and the estimate of the first information sequence is modulated to provide a modulated estimate of the first information sequence. The modulated estimate of the first information sequence is subtracted from the second separated signal to provide an improved second separated signal. The improved second separated signal is demodulated to provide an estimate of a second information sequence corresponding to the second information signal. Related receivers are also discussed.

C. The Anderson Reference

U.S. Patent No. 6,297,691, issued October 2, 2001 to Anderson et al. discloses a method and apparatus for demodulating coherent and non-coherent modulated signals. A receiver receives modulated message signals in non-coherent FSK and coherent 8PSK protocols. A selectively configurable processor demodulates the message signals, and includes a demodulator that derives in-phase and quadrature signals based on the message signals. A phase detector is responsive to the in-phase and quadrature signals and delayed in-phase and quadrature signals to derive a phase signal. A selector is responsive to the in-phase and quadrature signals to selectively connect a loop filter

between the phase detector and the demodulator. When the selector connects the filter between the phase detector and demodulator, the demodulator is responsive to filtered phase signals to lock onto a frequency of the message signals so that the processor operates as a phase locked loop to demodulate coherent modulated signals. When the selector disconnects the filter from between the phase detector and the demodulator, the demodulator demodulates non-coherent modulated signals and the phase detector supplies a phase signal representing the slope of the phase of the demodulated signal.

D. The Ben-Efraim Reference

U.S. Patent No. 5,999,793, issued December 7, 1999 to Ben-Efraim, et al., discloses a satellite receiver tuner chip with frequency synthesizer, having an externally configurable charge pump. The '793 patent discloses an improved DBS receiver front end architecture having a tuner chip and a demodulator/decoder chip. The front end includes a frequency synthesizer with an externally configurable charge pump on the tuner chip. The charge pump is coupled to a tank circuit having an adjustable resonance frequency. The resonance frequency can be adjusted over an entire octave by controlling the reverse bias voltage on a pair of varactors. A charge pump with a configurable gain is used to provide a control voltage to the tank circuit to provide a constant phase locked loop response over the frequency range of the tank circuit. Broadly speaking, the present invention concerns a DBS receiver front end which includes a tuner chip and a demodulator/decoder chip. The tuner chip is coupled to receive a receive signal and convert it to a baseband signal. The tuner chip includes an externally configurable charge pump, a tuning oscillator, and a downconverter. The charge pump receives binary inputs indicating a desired gain and responsively amplifies a phase difference signal by the desired gain to provide a correction signal to a loop filter. The loop filter is coupled to adjust a resonance frequency control voltage in a tank circuit according to the correction signal The tuning oscillator oscillates at the resonance frequency of the tank circuit. The downconverter receives a tuning frequency signal provided by the tuning oscillator, and combines it with a receive signal to produce a product signal.

V. Office Action Prior Art Rejections

A. Rejections Under 35 U.S.C. § 102(b)

On page (3), the Office Action rejected claims 1-30 under 35 U.S.C. § 102(b) as being anticipated by Ishio, U.S. Patent No. 4,039,961 (Ishio). Applicants respectfully traverse these rejections.

With Respect to Claim 1: Claim 1 recites:

> *An apparatus for receiving a non-coherent layered modulation signal comprising the sum of a first layer signal and a second layer signal, comprising:*
>
> *a tuner for receiving ~~a~~ the non-coherent layered signal and producing a layered in-phase signal and a layered quadrature signal therefrom;*
>
> *an analog-to-digital converter for digitizing the layered in-phase signal and the layered quadrature signal;*
>
> *a digital processor for processing the digitized layered in-phase signal and the digitized layered quadrature signal to produce a lower layer in-phase signal, a lower layer quadrature signal, an upper layer in-phase signal and an upper layer quadrature signal, the processor comprising a subtractor configured to subtract an ideal upper layer in-phase signal from the digitized layered in-phase signal to produce the lower layer in-phase signal and to subtract an ideal upper layer quadrature signal from the digitized layered quadrature signal to produce the lower layer quadrature signal;*
>
> *a digital-to-analog encoder for converting the lower layer in-phase signal and the lower layer quadrature signal to a lower layer in-phase analog signal and a lower layer quadrature analog signal; and*
>
> *a modulator for modulating the lower layer in-phase analog signal and the lower layer quadrature analog signal to produce a lower layer signal.*

In rejecting claims 1 as unpatentable over Ishio, the Office Action accorded no weight to the preamble. The Applicants have amended claim 1 to recite that the layered signal received by the tuner is a non-coherently layered signal.

Since Ishio does not disclose a tuner for receiving a non-coherent layered signal (col. 4, line 8 specifically discloses that the layered signal is coherent), the Applicant's respectfully traverse the rejection of claims 1-30 under 35 U.S.C. § 102(b).

Ishio also fails to disclose other features recited in claim 1. For example:

The Office Action indicates that claim 1's "tuner for receiving the non-coherent layered signal and producing a layered in phase signal and a layered quadrature signal therefrom" is disclosed by block 17 of FIG. 5. However, block 17 is merely a VCO.

The Office Action indicates that claim 1's "analog-to-digital converter for digitizing the layered in-phase signal and the layered quadrature signal" is disclosed by block 16 of FIG. 5 (the 4-Phase Signal Detection Circuit) and the following text:

> **will be described. The input 16-ary APK signal is applied from an input terminal 14 to a four-phase signal detection circuit 16 in a carrier recovery circuit 15 (a block indicated by the dotted lines) to be coherently detected with the reference carriers of the X-and Y-axes phase shown in FIG. 4 which is produced by a voltage controlled oscillator 17. The detected output is discrim-**

However, the foregoing discloses only a four phase signal detection circuit ... it does not disclose and A/D converter.

Similarly, the Office Action indicates that the D/A converter of claim 1 is disclosed by the regeneration circuit 18 of FIG. 5 and the following text:

> **controlled oscillator 17. The detected output is discriminated by a regeneration circuit 18 in order to detect the quadrant in which the signal vector is present (See FIG. 4), and the outputs derived from output terminals 19 and 20 correspond to the base band pulses applied to the input terminals ch1 and ch2 shown in FIG. 3.**

which, as can be seen, discloses only a regeneration circuit, not a D/A converter.

With Respect to Claim 19: Claim 19 recites the reception of a non-coherent layered signal, and is therefore patentable over the Ishio reference under 35 U.S.C. § 102(b). Claim 19 likewise recites digitizing the layered in-phase and layered quadrature signals and after conversion to a single layer in phase and quadrature signal, converting the signals to a single layer in-phase analog and a single layer quadrature signal. These features are also not disclosed in the Ishio reference.

With Respect to Claim 13: Claim 13 recites:

> *A digital processor for decoding a non-coherent layered signal to produce a single layer signal, comprising:*
>
> *a demodulator and decoder for decoding an upper layer signal from the non-coherent layered signal;*
>
> *an encoder for generating an ideal upper layer signal from the decoded upper layer signal;*
>
> *a signal processor for modifying the ideal upper layer signal to characterize transmission and processing effects; and*
>
> *a subtractor for subtracting the modified ideal upper layer signal from the layered signal to produce the single layer signal.*

As described above with respect to claim 1, Ishio does not disclose the demodulation of a non-coherent layered signal. Hence, claim 13, like claim 1, is patentable over Ishio under 35 U.S.C. § 102(b).

Claim 13 also recites a signal processor for modifying the ideal upper layer signal to characterize transmission and processing effects. The Office Action indicates that these features are disclosed as block 21 of FIG. 5 and in col. 4, line 18 as follows:

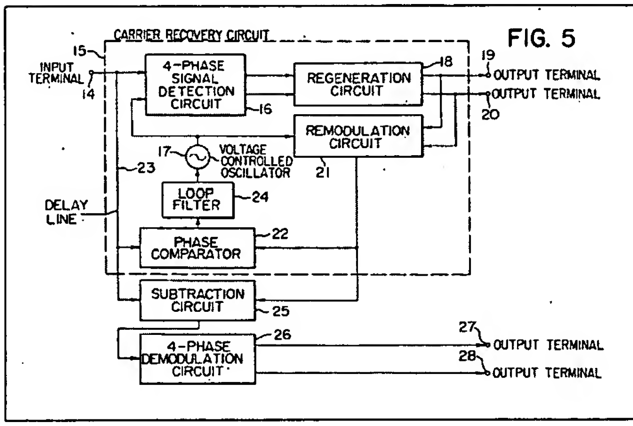

FIG. 5

The outputs from the regeneration circuit 18 are also applied to a re-modulation circuit 21 in order to modulate the reference carrier from the oscillator 17 into the four-phase modulated signal corresponding to the signal vector indicated by the solid line segment in FIG. 4. That is, the first path signal is regenerated. The first

However, all the foregoing discloses is a remodulation circuit. There is no disclosure that the remodulation circuit modify the ideal upper layer signal to characterize transmission and processing effects.

<u>With Respect to the Dependent Claims</u>: The dependent claims include the features of the independent claims they depend upon, and are patentable on this basis. These claims also recite features not disclosed in the Ishio reference.

B. Rejections Under 35 U.S.C. § 103(a)

1. Rejections Based on Arslan in View of Ishio

On page (7), the Office Action rejected claims 1-30 under 35 U.S.C. § 103(a) as being unpatentable over Arslan, U.S. Patent No. 6,574,235 (Arslan) and further in view of Ishio. Applicants respectfully traverse these rejections.

<u>Regarding the Combination of the Arslan and Ishio References and Non-Coherent Layered Modulation</u>: As the Office Action acknowledges, Arslan does not teach the use of layered

modulation. Nonetheless, it is argued that it would have been obvious to one of ordinary skill in the art to use the receiver disclosed by Arslan to receive the layered signals disclosed by Ishio because it would increase the information transmission rate of the system.

The Applicants respectfully disagree. Arslan teaches a communications system wherein signals are transmitted over a shared frequency band. However, the signals transmitted by transmitters other than the desired transmitter (in the specific case of Arslan, by different cell phones) are regarded as *interference* that need to be discriminated and rejected:

> Due to the limited availability of the signal spectrum, cellular radiotelephone systems have been developed wherein carrier frequencies are re-used in distant cells to increase spectral efficiency. Because of this frequency reuse, however, co-channel interference may be present at both mobile terminals and base stations. In response, there have been efforts to develop signal enhancing receivers to reduce the effects of co-channel interference. For example, see the reference by Medepalli et al. entitled "Combined Equalization And CoChannel Interference Cancellation For The Downlink Using Tentative Decisions" (IEEE 1999) the disclosure of which is hereby incorporated herein in its entirety by reference.
>
> The effects of co-channel interference (CCI) can conventionally be reduced by providing signal separation in the transmission of different signals. Cochannel signal separation is conventionally provided in an FDMA system by providing physical separation between two transmitters using the same carrier frequency and between the respective receiving base stations. Accordingly, a first signal is received by the first base station at a significantly higher strength than a second signal, and the second signal is received by the second base station at a significantly higher strength than the first signal. As cell sizes are reduced to provide greater capacity, however, the differences in signal strengths may be reduced making it difficult to receive one or both co-channel signals. Interference from signals transmitted on adjacent carrier frequencies (adjacent channel interference or ACI) can be accommodated by filtering the carrier frequency of interest.

The Office Action argues one of ordinary skill in the art would want to increase the information transmission rate of the system and he/she would do so using an Ishio's layered modulation scheme. However, even if this were true (instead of using any number of other possible ways to increase the information transmission rate) one must consider that in the Arslan system, signals from different transmitters are regarded as *interference*. Therefore, if one of ordinary skill in the art were to increase the information transmission rate in a *non-interfering way* using layered modulation, they would modify *each* transmitter to transmit a coherent layered modulation signal that would be received and demodulated. Other transmitters would still be transmitting an *interfering*

signal that the Arslan system would still reject. Therefore, Arslan, Ishio, and all prior art the Applicants are aware of, teach rejecting non-coherent signals as interference. There is no teaching of *non-coherent* layered modulation in either Arslan or Ishio, even when combined.

With Respect to Claims 1 and 19: Claim 1 recites:

> *An apparatus for receiving a non-coherent layered modulation signal comprising the sum of a first layer signal and a second layer signal, comprising:*
> *a tuner for receiving ~~a~~ the non-coherent layered signal and producing a layered in-phase signal and a layered quadrature signal therefrom;*
> *an analog-to-digital converter for digitizing the layered in-phase signal and the layered quadrature signal;*
> *a digital processor for processing the digitized layered in-phase signal and the digitized layered quadrature signal to produce a lower layer in-phase signal, a lower layer quadrature signal, an upper layer in-phase signal and an upper layer quadrature signal, the processor comprising a subtractor configured to subtract an ideal upper layer in-phase signal from the digitized layered in-phase signal to produce the lower layer in-phase signal and to subtract an ideal upper layer quadrature signal from the digitized layered quadrature signal to produce the lower layer quadrature signal;*
> *a digital-to-analog encoder for converting the lower layer in-phase signal and the lower layer quadrature signal to a lower layer in-phase analog signal and a lower layer quadrature analog signal; and*
> *a modulator for modulating the lower layer in-phase analog signal and the lower layer quadrature analog signal to produce a lower layer signal.*

According to the Office Action, the A/D converter is disclosed by the radio processor 19, the processor is disclosed by the decoder 102B shown in FIG. 4B, the digital-to-analog converter is disclosed by the re-encoder 104B, and the modulator by modulator 103B.

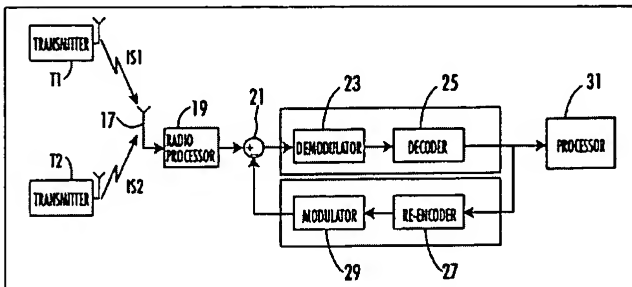

FIG. 1

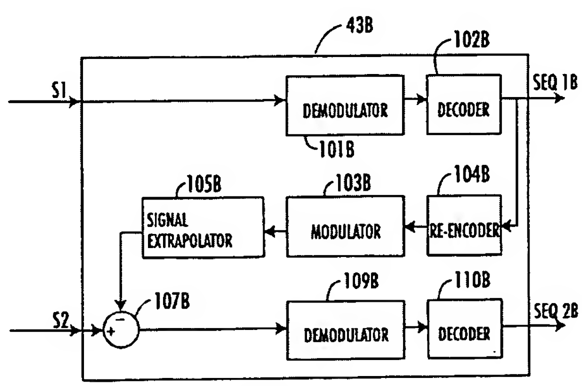

FIG. 4B

However, while FIG. 1 discloses a radio processor that digitizes the signal, block 102B decodes the signal and block 104B recodes the signal. Neither of these operations provide any D/A conversion. Instead, the conversion of that digitized signal to an analog signal occurs in the processor 31, not in decoder 102B:

> The common co-channel baseband signal is then demodulated using demodulator **23** and decoded using decoder **25** to provide an estimate of a first information sequence corresponding to the strongest information signal. The estimate of the first information sequence can then be processed using the processor **31** to reproduce the communication from the first transmitter **T1** transmitted as the first information signal **IS1**. Alternately, the estimate of the first information

Further, claim 1 has been amended to recite further details regarding the signals demodulated by the modulator recited in claim 1. With the recitation of these additional features (including the subtraction operations) it is clear that the modulator of the Arslan reference is not analogous to the modulator recited in claim 1 (the modulator recited in claim 1 modulates signals *after* subtraction, as shown by the modulator 544 in FIG. 5.

The Applicants also note another key architectural distinction between the invention expressed in claim 1 and the system shown in FIG. 4B of the Arslan reference and FIG. 5 of the Ishio reference. Both references require a "remodulator" (element 103B in the Arslan reference and element 21 in the Ishio reference). The Applicants' invention, however, does not require remodulation of the ideal upper layer signal. Instead, the architecture of the Applicants invention demodulates the upper layer (with elements 512 and 532 of FIG. 5) and subtracts the difference between the ideal upper layer signal and the layered signal without the remodulation required in both Ishio and Arslan, saving cost, circuit complexity, and power.

Claim 19 is patentable for analogous reasons.

<u>With Respect to Claim 13</u>: Claim 13 recites the non-coherent nature of the layered signal and that the signal processor characterizes both transmission and processing effects. As described above, these features are not disclosed in the Ishio and Arslan references, and the rejection of claim 13 is traversed.

With Respect to Dependent Claims 2, 4, 5, 8, 11, 12, 14, 15, 16, 17, 18, 20, 21, 22, 23, 26, 29 and 30: The Office action acknowledges that the Arslan does not expressly disclose (1) match filtering of the digitized layered in-phase and quadrature signals, (2) amplitude and phase matching and (3) applying signal maps, but opines that these features are inherently disclosed.

Inherency "may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1269(Fed. Cir. 1991). Instead, to establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co.,* 948 F.2d at 1268. Nothing in the Arslan reference requires that the foregoing functions be performed. The Applicants therefore respectfully traverse.

2. *Rejections Based on Ishio in View of Anderson*

On page (17), the Office Action rejected claims 1-30 under 35 U.S.C. §103(a) as being unpatentable over Ishio and further in view of Anderson, U.S. Patent No. 6,297,691 (Anderson). Applicants respectfully traverse these rejections.

With Respect to Claims 1-30: According to the Office Action, Ishio discloses layered modulation, but does not disclose the use of layered modulation with non-coherent layers. The Office Action then reasons that Anderson since discloses a non-coherent signal, it would be obvious to one of ordinary skill in the art "demodulate coherence and non-coherence signals reducing the cost of the decoder and to have compatibility with other systems" to offer compatibility with other systems.

The Applicants respectfully disagree. Anderson discloses a single circuit that is capable of demodulating signals in either the HART (coherent) and ISII (non-coherent) protocols. It does not disclose or suggest the demodulation of a multi-layer modulation signal with non-coherently modulated layers. Further, if one of ordinary skill in the art were to want to modify the Ishio system to allow compatibility with other systems (the Office Action's proffered motivation for modifying Ishio as described in Anderson), Anderson teaches that he/she would do so with a circuit that would operate with either one signal or the other, not by combining non-coherent layers.

3. Rejections Based on Ishio in View of Ben Efraim

On page (18), the Office Action rejection claims 5, 10, 12, 16, 18, 23, 28, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Ishio as applied to claims 1, 9, 13, 19, and 27, and further in view of Ben-Efraim. Applicants respectfully traverse these rejections.

The Office Action acknowledges that the Ishio does not disclose (1) match filtering of the digitized layered in-phase and quadrature signals, (2) amplitude and phase matching and (3) applying signal maps, but opines that these features are disclosed in Ben Efraim and that it would have been obvious to one of ordinary skill in the art to modify Ishio as described in Ben Efraim.

With Respect to Claims 5 and 23: While Ben Efraim discloses match filtering, the modulation and demodulation technique involved is entirely different than that of Ishio. In particular, the signal that is match filtered by the Applicants invention is a non-coherent layered signal. It is not apparent to the Applicant that based on the Ben Efraim disclosure match filtering would be an obvious modification of the Ishio reference.

With Respect to Claims 12 and 18: These claims involve amplitude and phase matching, not match filtering. It does not appear that these features are disclosed in the Ben Efraim reference.

With Respect to Claims 16 and 29: These claims recite the use of a signal map, not match filtering. It does not appear that these features are disclosed in the Ben Efraim reference.

4. Rejections Based on Arslan in View of Ben-Efraim

On page (20), the Office Action rejection claims 5, 10, 12, 16, 18, 23, 28, and 30 under 35 U.S.C. § 103(a) as being unpatentable over Arslan as applied to claims 1, 9, 13, 19, and 27, and further in view of Ben-Efraim. Applicants respectfully traverse these rejections.

The Office Action acknowledges that the Arslan does not disclose (1) match filtering of the digitized layered in-phase and quadrature signals, (2) amplitude and phase matching and (3) applying signal maps, but opines that these features are disclosed in Ben Efraim and that it would have been obvious to one of ordinary skill in the art to modify Ishio as described in Ben Efraim.

With Respect to Claims 5 and 23: While Ben Efraim discloses match filtering, the modulation and demodulation technique involved is entirely different than that of Ishio. In particular, the signal that is match filtered by the Applicants invention is a non-coherent layered

signal. It is not apparent to the Applicant that based on the Ben Efraim disclosure match filtering would be an obvious modification of the Arslan reference.

With Respect to Claims 12 and 18: These claims involve amplitude and phase matching, not match filtering. It does not appear that these features are disclosed in the Ben Efraim reference.

With Respect to Claims 16 and 29: These claims recite the use of a signal map, not match filtering. It does not appear that these features are disclosed in the Ben Efraim reference.

VI. New Claims

New claims 31-39 are presented for the first time in this Amendment. For the reasons described above, new claims 31-39 are patentable over the prior art of record, and the Applicants respectfully request the allowance of these claims as well.

VII. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

Georgann S. Grunebach, Reg. No. 33,179
Attorney for Applicants

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The DIRECTV Group, Inc.
RE / R11 / A109
P.O. Box 956
2250 E. Imperial Highway
El Segundo, CA 90245-0956

Phone: (310) 964-4615

IN THE DRAWINGS

Please amend Figures 1A-1C and 2A-2C as described in the attached substitute pages.